Control method for beer brewing process

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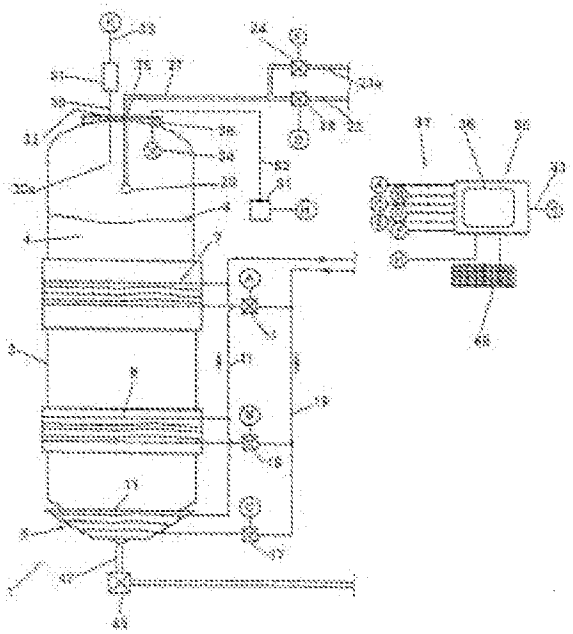
In a process to regulate the fermentation of a fluid within an enclosed vat (3), a camera (31) positioned above the fluid monitors the condition of the fluid surface (6) through an endoscope (30). If the vat is empty, the camera monitors the condition of the vat floor and lower sidewalls. The optical signals are captured in the visible range, including the infrared range, and are evaluated to regulate fermentation process parameters including pressure and temperature. An Independent claim is included for an assembly in which the process simultaneously controls fermentation in several vats.



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Die Erfindung betrifft ein Verfahren zur Steuerung des Gärprozesses, insbesondere bei der alkoholischen Getränkeherstellung, ein Gärgefäss und eine Vorrichtung und ein Verfahren zur Steuerung der Gärprozesse in mehreren Gärgefässen.

Wenn bei der Erzeugung von Getränken ein Gärungsprozess erforderlich ist, wie z. B. bei der Herstellung von Bier, wird er im allgemeinen in einem Gärgefäss durchgeführt, das ein offener oder ein geschlossener Tank sein kann. Bei der Bierherstellung z. B. wird die gekochte und abgekühlte Würze in das Gärgefäss geführt und Hefe dazugegeben. Dadurch beginnt der Gärprozess. Bei der Gärung handelt es sich um Stoffwechselvorgänge, bei denen Enzyme tätig werden, wodurch Wärme freigesetzt wird, so dass die Temperatur der gärenden Substanz steigt. Die Temperaturen müssen durch Kühlung in gewünschten Bereichen gehalten werden. Dazu sind entweder innerhalb oder ausserhalb am Gärgefäss Kühlschlangen vorgesehen, die von einer Kühlflüssigkeit durchflossen werden. Durch Messung der Temperatur und Steuerung der Kühlung kann bei bekannten Verfahren ein

Translation: German » English

The present invention relates to a method for controlling the fermentation process, particularly in the alcoholic beverage, a Gärgefäss and a device and a method for controlling the fermentation process in several Gärgefässen.

If in the production of drinks fermentation process is necessary, such as in the manufacture of beer, it is generally carried out in a Gärgefäss that an open or a closed tank can be. In beer production, for example, the cooked and cooled wort into the Gärgefäss and yeast is added. Thus begins the fermentation process. During the fermentation are metabolic processes in which enzymes are active, which heat is released, so that the temperature of the fermenting substance increases. The temperatures must be cooled in the required fields are kept. They are either inside or outside on Gärgefäss cooling provided by a coolant passes through. By measuring the temperature and controlling the cooling procedure can be known a specified temperature are observed.

To the fermentation process also to be monitored, can occur with the known methods using a sample glass of the review stage of fermenting matter be reviewed to

discuss the settling of the conclusion of the yeast fermentation process to be able to define. Also, a sample of the fermenting substance, and with the help of a Saccharometeranzeige be measured, as the fermentation process progresses. Conventional fermentation process of beer production are, for example, in the "Catechism of the brewery practice," Karl Lense, Verlag Hans Carl, Nuremberg, 16 Edition, 1996.

After fermentation, the fermented liquid either remain stored in the fermentation tank (the fermentation tank is then described as Unitank) or transferred to storage tanks. Subsequently, or in preparation of a further Gärgefäss the fermentation process must be purified. This is done by spraying of cleaning fluid in Gärgefäss.

To the fermentation process to be monitored are, therefore, in particular when closed fermentation tanks to be used during the fermentation process only the measured temperature, or the content, or extract a CO2 measurement. The actual course of fermentation, however, is dependent on many parameters, such as the seasoning used, the condition of the yeast, the storage conditions or the like. Since therefore no fermentation process exactly like the other, can only be at a given temperature of the fermentation process can be controlled.

When cleaning the Gärgefässes a

certain predetermined period of time in the cleaning fluid sprayed Gefass. This may come about but that the cleaning is incomplete or too long cleaning time available, which are cost- and time-intensive. Especially with the current rapid methods, however, these parameters are of crucial importance.

It is based on the described state of the art task of the present invention, a method for controlling the fermentation process, a Gärgefäss and a device and a method for controlling the fermentation process in a variety of Gärgefässen to define the best of the fermentation process can be influenced without that a permanent monitoring of persons is necessary, so that the Gärprozessführung simplified. This task is a procedure with the characteristics of claim 1, a Gärgefäss with the characteristics of claim 22 a device with the characteristics of claim 45 and a procedure with the characteristics of claim 41 solved.

According to invention is that the interior of the Gärgefässes continuously or at intervals from the upper area of optical signals to be used during the fermentation process the surface of the fermenting substance, or - with empty Gärgefäss - the ground and at least part of the side walls of the play and Gärgefässes that the signals to control the fermentation process used.

The invention is the monitoring of the interior of the Gärgefässes, whether open or

closed, possible without a direct observation by a person is necessary. The optical signals can, for example, as an image on a display screen to be, so that a person controls the process monitor and possibly intervene.

However, it is also possible that these optical signals to be processed electronically and in type of control loop parameters of the fermentation process to influence.

The invention exploits the fact exploit the fact that during the fermentation process the surface of the fermenting wort in a characteristic way (see, for example, "Catechism of the brewery practice," Karl Lense, Verlag Hans Carl, Nuremberg, 16th edition, 1996, Page 242 and 243, item 827) is changing. Depending on the stage of the fermentation process changes the surface color and texture. It formed in a known way of bubbles and foam, for example, with the symmetry of the Gärgefässes from the outside to the inside spread. These changes are reflected in the optical signals back from the surface of the substance to be fermenting. If these signals to a visual display screen, so can a person control the fermentation process directly observe, although the Gärgefäss closed. However, such optical signals are processed electronically and with known patterns or a Farbhistogramm compared.

The invention method thus enables a close monitoring of the fermentation process and setting the necessary parameters, such as

cooling or pressure, depending on the recorded signals, enabling the optimization of the fermentation process. For example, time can be saved, if observed, that the fermentation process is complete, or energy can be saved, if observed, that no further cooling is necessary.

Any subsequent storage of the substance in the fermented Gärgefäss may be optical signals from the surface of the fermented substance and the storage are monitored.

The optical signals can also be cleaned during the preparatory process and the purification of Gärgefässes be used for monitoring. The amount of the necessary cleaning fluid and the duration of the cleaning can be directly dependent on the state of cleaning interior surfaces of the Gärgefässes regulated. Is the inside of the Gärgefässes clean, the cleaning process is aborted, so that the effluent is reduced and a more fuel-efficient, time- and materialverschwendende cleaning is avoided. Just as during the fermentation process during the cleaning process the optical signals directly to an image display device by a user person to be monitored or electronically processed, the cleaning process to automate.

The inclusion of the optical signals can be done using a camera to be carried out. The camera can either be from the outside, eg through a sight glass through, from cover page with a closed Gärgefäss record. This solution has the advantage that

existing fermentation tank, the sight glasses which, with such a camera to be avoided. It may also be in place the camera inside the vessel only, but here in particular a micro-camera is in the upper area of the suitable Gärgefässes is made. The signals of these micro-camera with the appropriate cable connections from the Gärgefäss out to be. According to another advantageous form of execution, the optical signals with the help of an endoscope from the Gärgefäss led out, and outside of a recording Gärgefässes establishment. With the help of such an endoscopy clinic, the hygiene requirements for the easy way to sterility, since no mechanical or moving parts are available and an endoscope is a very small size can have.

The optical signal can be recorded in the visible spectral range, while the interior of the Gärgefässes illuminated. The lighting may be from outside, for example, also through a sight glass through, or with a light source arranged on the inside. It can then, if the lighting is synchronized with the camera, such as a flash, be a very large brightness generated so that clear images could be made. In this manner, direct the surface of the fermenting substance to monitor and control the fermentation process set up. Additionally or alternatively, the optical signals in the infrared spectral range covered. This allows the monitoring of heat distribution of the fermenting substance, for example, to optimally adjust the

cooling and convection to the fermenting substance to monitor or control them.

The recording device for recording the optical signals can be used in a fixed height within the Gärgefässes reasonably practicable. It can then easily be observed, how much the foam on the fermenting substance is, for example, by evaluating the size of the image, which the fermenting substance fill. In another form of execution, the location of the optical recording facility of the amount of the fermenting substance adapted so that always a constant distance between the host organization and the fermenting substance exists. This allows a precise observation of the surface structure or color of the fermenting substance.

It is also that these systems (camera from the outside or into the camera Gärgefäss used) is also arranged with suitable mirrors can work together, so that for example, the inside of the lid can be observed, which is in the cleaning of advantage is .

The optical signals can be used for regulating the adjustable parameters of the fermentation process used. Especially advantageous is to regulate the cooling of the Gärgefässes because the temperature is of crucial importance for the fermentation process is. Gärgefäss When closed, the optical signals to pressure control can be used. The pressure is also an important parameter in fermentation, as he decisively

influenced foaming.

Besides the color of individual areas of the surface of the fermenting substance the texture can also be used for evaluation. For example, the size of foam bubbles by comparison with corresponding reference values on the progress of the fermentation process to give.

In addition to the optical signals may also be other parameters, the conventional way in which Gärgefäss be measured, such as the extract content and temperature, in addition to monitoring can be used.

If the optical signals are electronically processed and analyzed, so these signals can, for example, with corresponding reference signals in a memory are compared to the fermentation process to be monitored. In another advantageous design are visual analytic methods for evaluating the optical signals. Such procedures allow bildanalytischen eg, determining the color of individual areas of the surface. Alternatively, the shapes of the surface texture with image-processing procedures to be determined. It can, for example, the size and shape of a determined area in which bubbles have formed, to the time of the fermentation process to be monitored.

If the optical signals are processed electronically, then by comparison with an appropriate threshold to determine whether the fermentation process in the form of unwanted runs, to an

appropriate warning to a user person to enter. For example, in the fermenting substance dependence, a maximum period, in which a particular color or a specific structural form of the surface texture is to be achieved. For failure of this value is a warning delivered.

The invention according Gärgefäss is implementing the inventive procedure, a normal optical recording facility, which at a height within a Gärgefässes is used during the fermentation process above the fermenting substance is, so that the surface of the fermenting substance, or - with empty Gärgefäss - the floor and a part of the side walls of the interior of the Gärgefässes can be.

Depending on requirements, the recording device for recording the visible spectrum and / or the infrared spectral suitable. If the visible spectral range of the optical signals are evaluated, it is preferably within a light Gärgefässes institution. Depending on requirements, the position and orientation of the luminous body medial or lateral offset in the fermentation tank are in place. A lateral transfer enabled by the shadow education is a better resolution of the level structure, while a central arrangement ensures a better coverage. It is understood that the luminous body Gärgefäss on the outside also may be ordered, eg in the area of an existing review glass lid. The lighting is taking a picture with coordinates. For example, the lighting device to be a flash.

The optical recording device may be firmly in the Gärgefäss installed. For a more precise look at the surface of the fermenting substance may be beneficial, but if the height is adjustable. This can preferably with a telescope facility possible. The recording device may be medial or lateral offset or aligned. A very large reception area is more central position, whereas the resolution of structures at different levels of lateral arrangement or orientation may be greater.

For electronic surveillance or regulation is in accordance with a further advantageous form of execution in a microprocessor. This may be a microprocessor control circuit unit include, for example, with the cooling units of Gärgefässes is to regulate the temperature. Alternatively or in addition, the microprocessor may be associated with valves, which regulate the pressure in the Gärgefäss possible.

An invention as procedures for controlling the fermentation process in a variety of Gärgefässen that are either closed with a sight glass or to open, the procedure described above are advantageous, but for the multitude of Gärgefässen at least one accessory is used.

This invention is only a small number, preferably on only one recording facilities needed for a larger number of Gärgefässen monitored. In this way, even in a large fermentation cellar with many Gärgefässen the process is

effectively monitored. When fermenting room, as they occur today's major brewers, in which up to 100 Gärgefässe there can be such an effective control of great advantage. All evaluation units or monitors, for example, by the host institution with signals must be simple or only in small numbers available. The at least one mobile recording facility will be from one to another Gärgefäss moved to the inside of the respective Gärgefässes record. This can vary depending on the requirement to ensure that this transport is controlled automatically or on a user action to the host institution from one to another Gärgefäss moved. In open Gärgefässen, for example, the host institution above the respective Gärgefässes placed. With closed Gärgefässen with a sight glass, the host institution prior to the sight glass is placed to move through this round the inside of the respective Gärgefässes incorporated.

The transportation agency for the host organization may have different forms. As a particularly advantageous has proved a robot, which is a very flexible locomotion of the host facility.

In another advantageous design, the host institution of a movable rail organization, so that a simple movement is possible. The rail can, for example, above the Gärgefässe be suspended, thus ensuring accurate placement.

In open Gärgefässen may be beneficial if the host

institution in addition to the respective fermentation tank lowered. This allows a more accurate recording of the surface of the fermenting substance to be preserved.

If at least one recording device for recording of optical signals in the visible forms, it may preferably provide a light body, which together with the host body is moved. In this way, always exactly Gärgefäss illuminated, being attacked by the host institution is inspected. With closed Gärgefässen must be the position of the luminous body, the host institution and the review of the show or glass jars of each Gärgefässes matched.

If the signals of at least one host institution with the help of a microchip is processed, it can be foreseen that this microprocessor also controls for the transportation facility for at least one host institution accepts. On the way is an optimal Sychronisation the position of the host institution and the optical signals.

If the signals from the host institution, for example, to produce a video signal is used, it is then possible that a change in the screen for the signals from each one of the tubes used. Of course, it is equally possible that, for each Gärgefäss a single screen is provided, whose picture is then updated when the host institution reopening of the Gärgefässes created.

As above for the control of a fermentation tank with an

individual host institution, are also in an apparatus for controlling a variety of Gärgefässen the optical signals to regulate the Gärparameter, eg temperature or pressure, in detail Gärgefäss use. This may, for example, the processor controlling the coolant or valves of the individual Gärgefässe depends on the optical recording of the corresponding Gärgefässes take.

The invention as control procedures will be explained in the attached figures, which forms the present invention devices. It shows

Figure 1, an execution form of an invention and Gärgefässes

Figure 2 is a schematic representation of an inventive modern form of execution of a device for controlling the fermentation process in a variety of Gärgefässen.

In the schematic Figure 1 refers to 1, the totality of the fermentation plant. 3, the Gärgefäss the implementation shown in the form of a conical-zylindro closed tank with a conical bottom 5. Such a tank may be, for example in the manufacture of beer a height of several meters. Above the conical section 5, a cylindrical section, the top by a lid is closed. The so-cultured fermentation tank 3 has three cooling zones 7, 9 a.m. to 11 p.m., which are thereby achieved that the outer scale down to the appropriate places cooling is achieved. For the opening of these valves cooling

serve 13, 15 and 17 The coolant supply 19 and the coolant outlet 21 are closer to a non shown refrigeration plant with a liquid in an appropriate temperature provides.

In the bottom of the fermentation tank 3 is an outflow 47 with a valve 49 for evacuation of fermented substance in the fermentation process.

The surface of the fermenting substance 4 is indicated at 6.

In the head area of the fermentation tank 3 is a pipe 27 by means of an implementation 26 in the fermentation tank 3 into it led. Via a valve 28, this feed 27 with a cleaning pipe 22 are connected. This line represents the so-called. CIP-line, ie, on this line in the process can be cleaned or the cleaning water will be initiated. About the same direction may also operate in the resulting carbon dioxide is removed, while in the valve 28 is closed and instead the valve 24 can be opened. By suitable control of the valve 24 allows the pressure inside the fermentation tank control. To this end, in the fermentation tank pressure transducer arranged to send a signal to the computer 35 can give the appropriate regulation of the valve 24 can provide.

In the head area of the fermentation tank 3, an electrical supply continues to 53 by carrying out 38th The electrical cable 53 has a lamp 34 connected. For a power supply serves 51st

Finally rises in the head area of the endoscope 3 is a fermentation tank 30 by an implementing 32 with a Endbereich 30a. The endoscope 30 is aligned so that the Endbereich 30a the surface 6 of fermenting substances 4 may be included. During the execution of the form shown is the amount of the endoscope 30 fixed. On the outside of the fermentation tank 3 we find the end of the endoscope 30 is a camera Annex 31 to include the signal from the endoscope 30 has been forwarded. About an electrical signal line 33 is this camera 31 with the Computer 35 connected. The signal line 33 is bidirectional, so that a signal to the host computer 35 by the camera 31 as a submitting a control signal from the computer 35 on the camera is 31 Possible.

Notwithstanding the execution of the form shown can be foreseen that the endoscope end 30a in the height is adjustable. Instead of the endoscope may be a micro-camera in the fermentation tank 3 shall be their signal via an electrical line from the fermentation tank 3 addition to the Computer 35 is kept. Of course the camera could also be based on a review provided on the cover glass are set up and this included round sight glass. Accordingly, the light source could also be 34 by the outside through a sight glass through light when recording.

The Computer 35 in a known manner comprises a screen 36 and a keyboard 45th The computer is on signal lines 37 directly or

indirectly via PLC (programmable logic controller) with various components of the fermentation plant 1 connected. The signal lines 37A, 37B, 37C lead to the coolant flow valves 13, 15, 17, while the signal line 37D with the CIP valve 28 is connected. The signal line 37E is connected to the Gasabführungsventilen 24. Are there more gas valves, which in the figure are not shown, then a correspondingly larger number of signal lines provided.

Finally, a signal line 37H to the power source lamp 51 for the 34th In the described implementation form, the unidirectional signal lines 37, to appropriate signals to the components correspond to the operation or to interrupt.

In Figure 1, for convenience sake is not shown, additional sensors in or on the fermentation tank to measure the temperature or extract content provided whose signal is added to a known method for the characterization of the fermentation process can be used. These sensors can also with the Computer 35 associated with the evaluation and may be used.

The fermentation process is referred to by the fermentation of wort with yeast to beer explained. In another process boiled wort is cooled and combined with yeast to a brewing substance 4 in the fermentation tank 3 introduced. This is roughly 2 / 3 filled. The enzymes of the yeast metabolic processes set in motion, in which heat is released. With the help of the endoscope 30 and the camera 31 is the change in the surface 6 in

the wort during the fermentation process was observed. The signal from the camera 31 is on the signal line 33 in the Computer 35 delivered. To send the monitoring computer 35 in predetermined intervals signals to the camera 31 and its operation again to quit. Typically, these intervals of several hours. Other time intervals or continuous observation, however, are also conceivable. The surface of the wort in a characteristic way changed their appearance. After several hours formed on the surface of white bubbles that are on the edge of the fermentation tank 3 spread. The following forms a layer on the surface in the course of time ripples and foam forms. The course is only exemplary stories, various types of wort or yeast can cause other paths. The course can be expected eg from previous experiments to be determined. The signal from the camera 31, on the screen 36 is shown, can be shed on the course of the fermentation process and its quality type. Similarly, the change in surface view, in order to speed the fermentation process to evaluate.

The temperature of the fermenting wort must be in the range of a few degrees Celsius kept. Since the heat of fermentation, the fermentation tank chilled. In dependence of the image on the screen 36 is displayed, a person operating the valves 13, 15, 17 being required to open and the cooling power, or increase or decrease. In this way is a direct influence on the fermentation process possible, even if, as in

the example shown a closed tank is used and a direct observation is not possible.

During the observation with the endoscope 30 is switched on the lamp 34 so that a sufficient brightness of the image in the fermentation tank 3 is available.

An enlarged picture of the excerpt, which occupies the surface 6, is an indication of increased foaming in the fermentation tank 3rd Then, by controlling the transfer of CO2, such as the pressure increases, in order to reduce foaming. They can pump in a per se known manner be provided. Also it can directly affect the fermentation process, although a direct observation in a closed fermentation tank is not possible.

The signal from the camera 31 can also be used for automatic regulation of Gärparameter used. This is the control of the Computer 35 in full. An operator can be the parameters of the fermenting material 4 on the keypad 45 in the Computer 35 to enter. In the computer can store data corresponding reference to the statements about the expected color of the surface 6 of the wort 4 at different fermentation process included. Can also be stored characteristic forms, which are at various stages of the fermentation process on the surface can be found.

After the wort with the yeast in the fermentation tank 3 is introduced, the computer sends 35 in preset intervals, a signal on

the line 33 in the camera 31, so that this interval as recorded by the surface gravity makes 6. Synchronous sends to the computer via the signal line 37H is a signal to the power supply 51 of the lamp 34, so that during the recording in the fermentation tank 3 is a sufficient brightness reigns. For continuous fermentation process changes as described above the surface of the fermenting substance 4th The computer 35 can be the surface 6 or individual areas which capture color and with the reference data in memory to compare. In this way the computer can be the continuous fermentation process monitor. In addition, by imaging processes, which themselves are known, the shape of individual structures and the structures stored in memory are compared to the fermentation process at different times are typical. If such a structure or expected color on a given date is not reached, Computer 35 may generate a warning signal to a control person to warn that the fermentation process in unerwünschterweise expires. Similarly, other process disturbances are detected, such as an excessive foaming, making the surface of 6 of the wort 4 closer to the recording area 30a of the endoscope, and therefore the image to fill a larger part of what is good with a computer 35 in known about visual analytic procedures can be identified.

Notwithstanding the execution of the form in which the Computer 35 will generate a warning, the computer can also directly regulate the Gärparameter take.

Displays the analysis of the images of the surface 6 of the fermenting substance 4, that the fermentation is too high temperature generated, the computer sends a signal to one or more of the valves 13, 15, 17 on the signal lines 37A, 37B or 37C, the coolant running through the cooling coil 7, 9 or 11 allow or enlarge. Change in the surface 6 in the desired manner, a signal from the computer 35 the valves to close or reduce the flow.

Displays the analysis of the images is too big foam, so the computer can by closing the gas valves 24 The escape of carbon dioxide control so that the foam formation is reduced. This is done until the foam in a tolerable extent, which by comparison with appropriately in the memory of the Computer 35 stored values is done.

In this way, a complete control of the fermentation process in the way of a control loop possible, without any human assistance from the outside would have to intervene.

It goes without saying that in the evaluation and regulation by the Computer 35 signals from other measuring devices are included, in a known manner or in the fermentation tank 3 shall extract such as gauges and temperature sensors.

In addition to the above analysis of the optical signal in the visible range can provide a camera 31, which also covers the infrared spectral range. An infrared recording surface 6 of

the wort 4 gives direct information about the heat distribution in the wort. It is the absolute temperature and the need, whether the increased or reduced cooling needs to be determined. The infrared image can also be assisted by the Computer 35 evaluated and be used to regulate. From the infrared image can also be information about the convection within the fermentation tank 3 winners. While an infrared recording, it is not necessary that the lamp is 34 Operating.

Although the wort in the fermentation tank 3 are not observed directly, it can be an optimal Gärverlauf be achieved, leading to energy savings, eg in the cooling process, and a lead time savings.

The fermentation process is completed, as confirmed by analysis of the corresponding optical signals by the Computer 35 can be identified, the fermented wort 4 from the tank 3 will be removed. Alternatively, you can also first stored in the fermentation tank to be carried out. While this storage may be just a visual observation of monitoring using the proposed invention the host institution.

Upon completion of the fermentation process and storage time, the fermented substance 4 by the line 47 and the valve 49 is removed. Subsequently, the fermentation tank cleaned 3 to prepare a further fermentation process. During the fermentation process have on the inside of the tank 3 deposits formed. In

particular, in the amount of the mirror surface 6 images on the edge residues, called Brandhefe. To remove these and other residues is determined by the spray head 29 of the water supply line 27 into the fermentation tank eingesprüht. This will open the valve 28. During this purification process, the interior of the fermentation tank 3 with the help of the endoscope 30 and the camera 31 and the corresponding optical signal via the line 33 in the Computer 35, who is on the screen 36 represents. An operator may, by observation of the interior of the fermentation tank on the screen 36 to judge whether the cleaning is already sufficient, and the cleaning process according to exit. Similarly, it can be decided whether an increased water intake is needed, ie, 28 Next, the valve must be opened.

Notwithstanding this can include the Computer 35 by the camera 31 relating image during purification process and directly entsprechenderweise as described above for the fermentation process described by image analytical methods and reference comparisons to determine whether the cleaning process is sufficient. Thus, a clean image of the tanks of the current image from the camera 31 relating will be deducted in order for differences between these two shots the cleaning process to continue. When the shell is finally clean, the same images and compared the cleaning process is overseen by the Computer 35 is interrupted by the valve 28 is

closed. As above for the fermentation process described, the camera can be either interval or continuously operated. To create a visual image in the visible range to obtain, while the camera is currently operating the lamp 34 switched on, what the computer is a signal via the signal line 37H to the power supply 51 sends.

With the invention of modern recording equipment for the fermentation tank, it is therefore possible, the cleaning process. Accordingly, time and energy can be saved, resulting in a greater efficiency and effectiveness leads.

Notwithstanding the above form can also run an open fermentation tank used because there automate the fermentation process is desirable and a direct observation can be difficult.

In Figure 2, the fermentation process control in a facility with multiple Gärgefässen 150 shown schematically. In these Gärgefässen is brewing to the surface with liquid 160th The Gärgefässen taking place in these processes correspond to the top of the Gärgefäss of Figure 1 described processes. Figure 2 shows, however, a version with open Gärgefässen 150th

Above the Gärgefässe 150 is a rail 138 arranged on a role of 134 runs, by a drive belt 136, to the pulleys 100, 102 runs, driven will. The drive for the driven pulley 100 is with a computer connected to 135. During the execution of the form shown over

135 of these computers to evaluate the same function as the computer described above 35th In addition, he assumes the control of the host facility 130 with the help of the engine 137, the force in a known way with the 100 collaborative role is.

On the drive roller 134 depends on a recording device on a telescope facility 132nd This telescope body 132 depends on a control line, the figure is not shown, with the computer 135 along the height of the accessory 130 with the help of the telescope body 132 controls. The inclusion bodies 130 may, for example, a camera or an infrared camera, which also signals to the computer 135 sends to the evaluation.

Together with the host facility 130 is on the telescope body 132 a light body 140 attached to the illumination of the surface 160 of the fermentation tank to be inspected each serves.

The camera 130 is from the computer 135 on the drive pulley 100 to the recording of the interior of each Gärgefässe 150 moves. After taking a picture in the first Gärgefäss the telescope body 132 retracted, the roller 134 along the rail to the next procedural Gärgefäss and the telescope body 132 deployed again to start the camera recording in the appropriate position in Gärgefäss cut. The recording and analysis of images of the surface of the fermenting substance will be from the Computer 35 in the same way and processed as described above for the computer

135 in the case of an individual described fermentation tank.

The luminous body 140 is then always by the computer 135 in operation when the camera 130 in the host position. If the camera is in the infrared range, it is a luminous body is not necessary.

The movement of the camera 131 can be periodically from the computer 135 will be set by a user or be triggered by a special Gärgefäss watch.

When automatic movement is on the computer 135 such as on a screen also indicated that the Gärgefässe observation is just.

In this way, in a clear way of controlling the fermentation process in various Gärgefässen a fermenting room possible, with only a single host institution must be used. As in the rarest cases, a continuous monitoring of all Gärgefässe while necessary, this procedure offers a significant savings and simplification of the fermentation process and the monitoring process.

In Figure 2 are open Gärgefässe presented. Even in a fermenting room with closed Gärgefässen the procedure can be advantageous, if the closed Gärgefässe sight glasses which, by the camera 130 can be round. The sight glasses must be an appropriate size, or in a sufficient number per fermentation tank available, so that lighting is possible, if the optical field should be included.

Figure 2 shows an execution form in which the fermentation tank 150 in a fermenting room are lined up and a rail is about 138. If multiple rows in a fermentation tank of fermenting room, then the rail itself must be understood according to this series to follow. Alternatively, several tracks with a corresponding number of recording facilities shall be provided.

Instead of the rail 138 with the corresponding drive rollers can also be used a robot to include the establishment of a fermentation tank 150 to another fermentation tank 150 moves. This robot can also take over the height, in the execution form of Figure 2 with the help of the telescope body 132 is achieved. With such a robot can quickly and flexibly to the specific requirements of the fermentation reaction.

In the same way as above for the case of an individual described fermentation tank, the device used to control the fermentation process in several fermentation tank even when the cleaning of the fermentation tank or the storage of the fermented substance used.

In the above examples is the regulation of the fermentation process by setting the temperature or the pressure and cooling are described. Other components are adjustable, so the scheme can also be the Computer 35 or 135 be adopted.

The above examples deal with the fermentation of wort to beer. The

invention process and the inventive modern equipment but also in the manufacture of other products einsatzbar in which a fermentation process takes place.

The invention process, the invention as Gärgefäss and the invention device allows the optimization of the fermentation process including the process of cleaning Gärgefässes or Gärgefässe, whereby the efficiency and the quality of the fermentation process must be increased.

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